

# UTILITY PATENT APPLICATION TRANSMITTAL UNDER 37 C.F.R. §1.53(b)

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Box PATENT APPLICATION

Washington D.C. 20231

Case Docket No.: CIT/K-090

Sir:

Transmitted herewith for filing is the patent application of

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OR: METHOD FOR TRANSMITTING SIGNAL OF MEDIUM ACCESS CONTROL SUBLAYER IN MOBILE COMMUNICATION SYSTEM

Enclosed are:

1. ☒ 16 pages of specification, claims, abstract
2. ☒ 2 sheets of FORMAL drawing.
3. ☒ 2 pages of newly executed Declaration & Power of Attorney (original).
4. ☒ Priority Claimed.
5. ☐ Small Entity Statement.
6. ☐ Information Disclosure Statement, Form PTO-1449 and reference.
10. ☒ Authorization under 37 C.F.R. §1.136(a)(3).
11. ☐ Other:
7. ☒ Assignment Papers for LG Electronics Inc. (cover sheet, assignment & assignment fee).
8. ☒ Certified copy of Korean Patent Application No. 41482/1998, filed October 1, 1998.
9. ☒ Two (2) return postcards.  
☒ Stamp & Return with Courier.  
☒ Prepaid Postcard-Stamped Filing Date & Returned with Unofficial Serial Number.

## CLAIMS AS FILED

For	No. Filed	No. Extra	Rate	Fee
Total Claims	13	- 20	X \$18.00	\$0.00
Indep. Claims	2	- 3	X \$78.00	\$0.00
Multiple Dependent Claims (If applicable)			X \$260.00	\$0.00
			BASIC FEE	\$760.00
			TOTAL FILING FEE	\$760.00

- ☐ This is a Continuation-in-part (CIP) of prior application No: \_\_\_\_\_ filed \_\_\_\_\_. Incorporation By Reference-The entire disclosure of the prior application is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
- ☐ Amend the specification by inserting before the first line the sentence:  
--This application is a continuation-in-part of Application Serial No. \_\_\_\_\_ filed \_\_\_\_\_.--
- ☒ A check in the amount of \$760.00 (Check # 7678) is attached.
- ☐ Please charge my Deposit Account No. 16-0607 in the amount of \$\_\_\_\_. A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 16-0607. A duplicate copy is enclosed.
- ☒ Any additional filing fees required under 37 C.F.R. 1.16.
- ☒ The Commissioner is hereby authorized to charge payment of following fees during the pendency of this application or credit any overpayment to Deposit Account No. 16-0607. A duplicate copy of this sheet is enclosed.
- ☒ Any patent application processing fees under 37 C.F.R. 1.17.
- ☒ Any filing fees under 37 C.F.R. 1.16 for presentation of extra claims.

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METHOD FOR TRANSMITTING SIGNAL OF MEDIUM ACCESS CONTROL  
SUBLAYER IN MOBILE COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates in general to a mobile communication system, and more particularly to a method for transmitting a signal of a medium access control (referred to hereinafter as MAC) sublayer in a mobile communication system.

Description of the Prior Art

Various methods have been proposed to transmit signals in a mobile communication system. One such conventional signal transmission method may be a data frame-type method which varies a data rate according to a service type.

However, the above-mentioned conventional signal transmission method has a disadvantage in that it cannot transmit efficient data because it varies the data rate according to the service type without regarding environmental factors.

SUMMARY OF THE INVENTION

Therefore, the present invention has been made in view of

the above problem, and it is an object of the present invention to provide a method for transmitting a signal of a MAC sublayer in a mobile communication system, in which the most efficient data is transmitted on the basis of a service type and a measured radio environment result.

In accordance with one aspect of the present invention, the above and other objects can be accomplished by a provision of a method for transmitting a signal of a medium access control sublayer in a mobile communication system which has mobile and base stations for providing a bearer service, comprising the first step of deciding a bearer service profile type according to a bearer service combination type of the bearer service to provide the bearer service; and the second step of setting a transport format indicator according to the decided bearer service profile type and appending a transport format combination indicator to a dedicated physical control channel.

In accordance with another aspect of the present invention, there is provided a method for transmitting a signal of a medium access control sublayer in a mobile communication system which has mobile and base stations for providing a bearer service, comprising the first step of allowing an application layer to decide a bearer service combination type of the bearer service; the second step of allowing a radio resource control layer to measure a radio

environment between the mobile and base stations; the third  
step of allowing the radio resource control layer to decide a  
bearer service profile type according to the decided bearer  
service combination type and the measured radio environment  
result and then assign a transport format combination set; the  
fourth step of allowing the medium access control sublayer to  
select appropriate transport formats within the assigned  
transport format combination set; and the fifth step of  
allowing a specific layer to set attributes of a dynamic part  
and semi-static part of the selected transport formats and  
append a transport format combination indicator to a dedicated  
physical control channel.

In a feature of the present invention, the most efficient  
data is transmitted on the basis of a service type and a  
measured radio environment result. Therefore, a data frame  
format most suitable to a channel environment can be produced,  
thereby providing the best service.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of  
the present invention will be more clearly understood from the  
following detailed description taken in conjunction with the  
accompanying drawings, in which:

Figs. 1a and 1b are flowcharts illustrating a method for

transmitting a signal of a MAC sublayer in a mobile communication system in accordance with the preferred embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1a and 1b are flowcharts illustrating a method for transmitting a signal of a MAC sublayer in a mobile communication system in accordance with the preferred embodiment of the present invention.

A base station provides simultaneous parallel data services. Different services have independent bit rates, bit error rates, degrees of transparency, throughputs, packets and circuit-switched transfer modes, respectively.

There may be about three different service types in three different environments. The three different service types are generally bearer service types with combinations of speech, circuit data and packet data services. The present invention includes a transport format indicator/transport format combination indicator(referred to hereinafter respectively as TFI/TFCI) concept related to bearer services and environments.

Now, a detailed description will be given of the coupling between TFI/TFCI values and a service profile type in communication based on the signal transmission method of the present invention with reference to Figs. 1a and 1b.

As shown in Fig. 1a, first, an application (referred to hereinafter as AP) layer of a mobile station decides a bearer service combination type to provide a bearer service based on a service profile type and outputs information regarding the decided bearer service combination type to a radio resource control (referred to hereinafter as RRC) layer.

The service profile type includes bearer service combination, bearer service class and environment items. The TFI/TFCI values are in close connection with the service profile type.

The bearer service combination type includes a bearer service category defined by a combination of speech, circuit data and packet data services. The bearer service category includes any one of only the speech service, only the circuit data service, only the packet data service, a combination of simultaneous speech and packet data services, a combination of simultaneous speech and circuit data services, a combination of simultaneous packet data and circuit data services and a combination of simultaneous speech, packet data and circuit data services.

The bearer service class type is classified into four classes A, B, C and D according to a bit rate and a quality of service.

The class A has connection oriented and delay constrained characteristics for low delay data, and is further classified

into three types.

The first type of the class A has 8kbps peak data rate, 20ms delay and bit error rate (BER) $<10^{-3}$  characteristics, the second type has 144kbps peak data rate, 50ms delay and BER $<10^{-6}$  characteristics and the third type has 384kbps peak data rate, 50ms delay and BER $<10^{-3}$  characteristics.

The class B has variable bit rate, connection oriented and delay constrained characteristics for low delay data at a variable bit rate, and is further classified into four types.

The first type of the class B has 64kbps peak data rate, 50ms delay, BER $<10^{-6}$  and 16kbps granularity characteristics, the second type has 144kbps peak data rate, 50ms delay, BER $<10^{-6}$  and 16kbps granularity characteristics, the third type has 384kbps peak data rate, 50ms delay, BER $<10^{-6}$  and 16kbps granularity characteristics, and the fourth type has 2048kbps peak data rate, 50ms delay, BER $<10^{-6}$  and 32kbps granularity characteristics.

The class C has connection oriented and delay constrained characteristics for long constrained delay data, and is further classified into four types.

The first type of the class C has 64kbps peak data rate, 300ms delay, BER $<10^{-6}$  and 16kbps granularity characteristics, the second type has 144kbps peak data rate, 300ms delay, BER $<10^{-6}$  and 16kbps granularity characteristics, the third type has 384kbps peak data rate, 300ms delay, BER $<10^{-6}$  and 16kbps

granularity characteristics, and the fourth type has 2048kbps peak data rate, 300ms delay,  $BER < 10^{-6}$  and 32kbps granularity characteristics.

5 The class D has connectless and delay unconstrained characteristics for unconstrained delay data, and is further classified into four types.

10 The first type of the class D has 64kbps peak data rate, unconstrained delay and  $BER < 10^{-8}$  characteristics, the second type has 144kbps peak data rate, unconstrained delay and  $BER < 10^{-8}$  characteristics, the third type has 384kbps peak data rate, unconstrained delay and  $BER < 10^{-8}$  characteristics and the fourth type has 2048kbps peak data rate, unconstrained delay and  $BER < 10^{-8}$  characteristics.

15 Then, upon the information regarding the decided bearer service combination type from the AP layer, the RRC layer of the mobile station performs a measurement request/report procedure with an RRC layer of a base station. In the measurement request/report procedure, periodic, on-demand and threshold information are obtained and a radio environment is  
20 measured on the basis of the obtained information. The RRC layer of the mobile station decides a bearer service profile type according to the bearer service combination type decided by the AP layer and the measured radio environment result and then performs a radio access bearer set-up procedure with the  
25 RRC layer of the base station.



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The measured radio environment result may generally be classified into three models according to the obtained periodic, on-demand and threshold information, or an indoor environment model, an outdoor to indoor and pedestrian environment model and a vehicular environment model. The base station economically operates these three environment models.

In the radio access bearer set-up procedure, after deciding the bearer service profile type, the RRC layer of the mobile station assigns a transport format combination set and transfers information of the assigned transport format combination set to a MAC sublayer and layer 1 L1 of the mobile station.

Then, the MAC sublayer of the mobile station selects appropriate transport formats within a transport format set assigned according to the transport format combination set assigned by the RRC layer and transfers a transport format indicator to the layer 1 L1.

The layer 1 L1 of the mobile station controls a configuration thereof according to the transport format combination set assigned by the RRC layer and the transport format indicator transferred by the MAC sublayer.

The L1 configuration control is performed by setting attributes of a dynamic part and semi-static part of the selected transport formats according to the transport format combination set assigned by the RRC layer and the transport

format indicator transferred by the MAC sublayer.

The dynamic part attributes include a transport block size and transport block setup size.

5 The semi-static part attributes include a transport time interval, a type of channel coding, outer coding such as Reed-Solomon coding, outer interleaving, inner coding, inner interleaving and rate matching.

10 The outer interleaving attribute represents the depth of outer interleaving in a radio frame and the inner interleaving attribute represents the depth of inner interleaving in the radio frame.

15 Further, the layer 1 L1 of the mobile station appends a transport format combination indicator to a dedicated physical control channel (DPCCH) according to the transport format combination set assigned by the RRC layer and the transport format indicator transferred by the MAC sublayer.

The transport format combination indicator is asymmetrically assigned between the mobile station and the base station.

20 A layer 1 L1, MAC sublayer, RRC layer and AP layer of the base station perform the same operations as those in the mobile station, respectively, as shown in Fig. 1b, to provide the bearer service, and a description thereof will thus be omitted.

25 As apparent from the above description, according to the

present invention, the most efficient data is transmitted on the basis of a service type and a measured radio environment result. Therefore, the present invention has the effect of producing a data frame format most suitable to a channel environment so as to provide the best service.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

WHAT IS CLAIMED IS:

1. A method for transmitting a signal of a medium access control sublayer in a mobile communication system which has mobile and base stations for providing a bearer service, comprising the steps of:

a) deciding a bearer service profile type according to a bearer service combination type of said bearer service to provide said bearer service; and

b) setting a transport format indicator according to the decided bearer service profile type and appending a transport format combination indicator to a dedicated physical control channel.

2. The method as set forth in Claim 1, wherein said bearer service profile type includes a service type and a radio environment.

3. The method as set forth in Claim 2, wherein said service type includes said bearer service combination type and a bearer service class type.

4. The method as set forth in Claim 3, wherein said bearer service combination type includes a bearer service category defined by a combination of speech, circuit data and

packet data services, said bearer service category including any one of only said speech service, only said circuit data service, only said packet data service, a combination of simultaneous speech and packet data services, a combination of simultaneous speech and circuit data services, a combination of simultaneous packet data and circuit data services and a combination of simultaneous speech, packet data and circuit data services.

5. The method as set forth in Claim 3, wherein said bearer service class type includes any one of first to fourth classes, said first class having connection oriented and delay constrained characteristics for low delay data, said second class having variable bit rate, connection oriented and delay constrained characteristics for low delay data at a variable bit rate, said third class having connection oriented and delay constrained characteristics for long constrained delay data, said fourth class having connectless and delay unconstrained characteristics for unconstrained delay data.

6. The method as set forth in Claim 2, wherein said radio environment includes any one of an indoor environment model, an outdoor to indoor and pedestrian environment model and a vehicular environment model which are classified according to periodic, on-demand and threshold information.

7. The method as set forth in Claim 1, wherein said step b) includes the step of setting attributes of a dynamic part and semi-static part of transport formats according to said transport format indicator.

8. The method as set forth in Claim 7, wherein said attributes of said dynamic part include a transport block size and a transport block setup size.

9. The method as set forth in Claim 7, wherein said attributes of said semi-static part include a transport time interval, a type of channel coding, outer coding such as Reed-Solomon coding, outer interleaving, inner coding, inner interleaving and rate matching.

10. A method for transmitting a signal of a medium access control sublayer in a mobile communication system which has mobile and base stations for providing a bearer service, comprising the steps of:

a) allowing an application layer to decide a bearer service combination type of said bearer service;

b) allowing a radio resource control layer to measure a radio environment between said mobile and base stations;

c) allowing said radio resource control layer to decide a bearer service profile type according to the decided bearer

service combination type and the measured radio environment result and then assign a transport format combination set;

d) allowing said medium access control sublayer to select appropriate transport formats within the assigned transport format combination set; and

e) allowing a specific layer to set attributes of a dynamic part and semi-static part of the selected transport formats and append a transport format combination indicator to a dedicated physical control channel.

11. The method as set forth in Claim 10, wherein said step b) includes the step of determining whether said radio environment includes any one of an indoor environment model, an outdoor to indoor and pedestrian environment model and a vehicular environment model which are classified according to periodic, on-demand and threshold information.

12. The method as set forth in Claim 10, wherein said attributes of said dynamic part include a transport block size and a transport block setup size.

13. The method as set forth in Claim 10, wherein said attributes of said semi-static part include a transport time interval, a type of channel coding, outer coding such as Reed-Solomon coding, outer interleaving, inner coding, inner

interleaving and rate matching.

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ABSTRACT OF THE DISCLOSURE

A method for transmitting a signal of a medium access control sublayer in a mobile communication system which has mobile and base stations for providing a bearer service. A bearer service profile type is decided according to a bearer service combination type of the bearer service for the provision of the bearer service. A transport format indicator is set according to the decided bearer service profile type, and a transport format combination indicator is appended to a dedicated physical control channel. The most efficient data is transmitted on the basis of a service type and a measured radio environment result. Therefore, a data frame format most suitable to a channel environment can be produced, thereby providing the best service.

FIG.1A

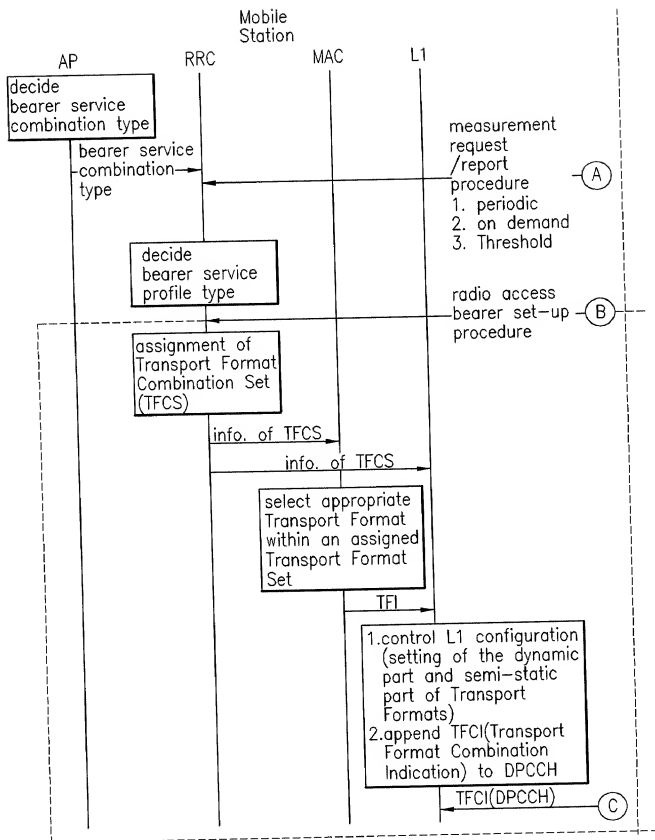
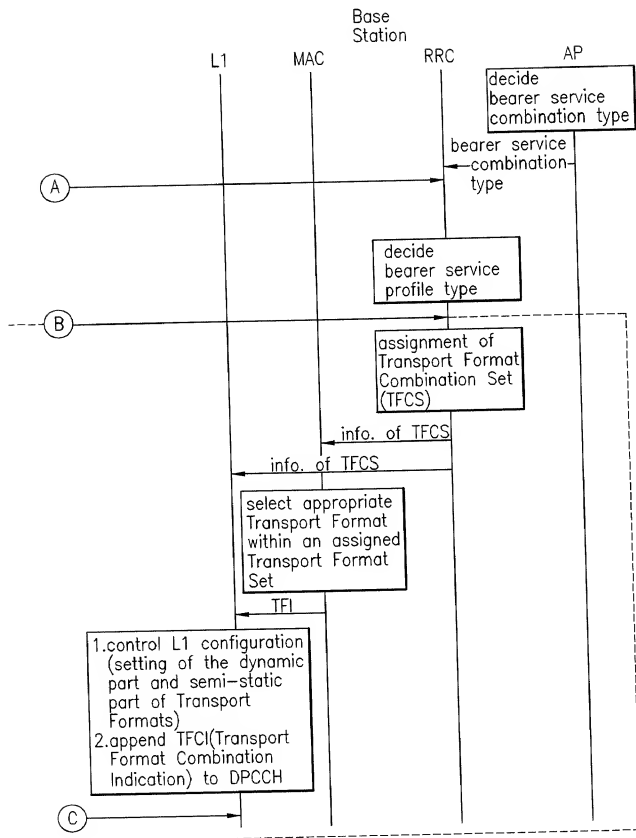


FIG.1B



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Docket No.: \_\_\_\_\_

## DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought on the invention entitled METHOD FOR TRANSMITTING SIGNAL OF MEDIUM ACCESS CONTROL SUBLAYER IN MOBILE COMMUNICATION SYSTEM

\_\_\_\_\_, the specification of which

[ X ] is attached hereto [ ] was filed on \_\_\_\_\_ as Application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known to me to be material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365 (b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

<u>Prior Foreign Number</u>	<u>Country</u>	<u>Foreign Filing Date Month/Day/Year</u>
41482/1998	Korea	October/1/1998

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

<u>Application Number(s):</u>	<u>Filing Date (Month/Day/Year)</u>
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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

<u>Prior U. S. Application or PCT Parent Number</u>	<u>Filing Date (Month/Day/Year)</u>	<u>Parent Patent Number (if applicable)</u>
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) and/or agent(s): Daniel Y.J. Kim, Registration No. 36,186 and Mark L. Fleshner, Registration No. 34,596; Carl R. Wesolowski, Registration No. 40,372; John C. Eisenhart, Registration No. 38,128; Rene A. Vazquez, Registration No. 38,647; Michael J. Cornelison, Registration No. 40,395; and Stuart I. Smith, Registration No. 42,159; and Carol L. Druzbeck, Registration No. 40,287, all of

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with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and all future correspondence should be addressed to them.

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